RULE 21—GENERATING FACILITY INTERCONNECTIONS

A. APPLICABILITY

This Rule describes the interconnection, operating and metering requirements for Generating Facilities intended to be connected to PG&E's Distribution System over which the Commission has jurisdiction. Subject to the requirements of this Rule, PG&E will allow the interconnection of Generating Facilities with its Distribution System. Definitions for the capitalized terms used in this Rule and not otherwise defined are defined in Section H of this Rule. The definitions in this Rule shall only apply to this Rule and shall not apply to PG&E's other tariffs. It is contemplated that the Applicant will be required to execute various enabling documents, such as but not limited to the Generating Facility Interconnection Agreement ("Agreement") (Form 79-973) and Application to Interconnect A Customer-Owned Generating Facility ("Application") (Form 79-974). Such documents shall be on file with the Commission, as may be amended from time to time.

B. GENERAL, RULES, RIGHTS AND OBLIGATIONS

1. Authorization Required to Interconnect. A Producer must comply with this Rule, and the terms of the Agreement, and receive PG&E's express written permission to interconnect before connecting or operating a Generating Facility in parallel with PG&E's Distribution System. PG&E shall apply this Rule in a non-discriminatory manner and shall not unreasonably withhold its permission to interconnect a Producer's Generating Facility.

2. Separate Arrangements Required for Other Services. A Producer requiring other electric services from PG&E including, but not limited to, Distribution Service provided by PG&E during periods of curtailment or interruption of a Generating Facility, must enter into separate arrangements with PG&E for such services in accordance with PG&E's Commission-approved Tariff Schedules.

3. Transmission Service Not Provided with Interconnection. Interconnection with PG&E's Distribution System under this Rule does not provide a Producer any rights to utilize PG&E's Distribution System for the transmission or distribution of electric power, nor does it limit those rights.

4. Compliance with Laws, Rules, and Tariff Schedules. A Producer shall ascertain and comply with applicable Commission-approved Tariff Schedules, and regulations of PG&E; applicable Federal Energy Regulatory Commission (FERC) approved rules, tariffs, and regulations; and any local, state or federal law, statute or regulation which applies to the design, siting, construction, installation, operation, or any other aspect of the Producer's Generating Facility and Interconnection Facilities.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

B. GENERAL, RULES, RIGHTS AND OBLIGATIONS (Cont'd.)

5. Design Reviews and Inspections. PG&E shall have the right to review the design of a Producer's Generating Facility and Interconnection Facilities and to inspect a Producer's Generating and/or Interconnection Facilities prior to the commencement of Parallel Operation with PG&E's Distribution System. PG&E may require a Producer to make modifications as necessary to comply with the requirements of this Rule. PG&E's review and authorization for Parallel Operation shall not be construed as confirming or endorsing the Producer's design or as warranting the Generating and/or Interconnection Facilities' safety, durability or reliability. PG&E shall not, by reason of such review or lack of review, be responsible for the strength, adequacy, or capacity of such equipment.

6. Right to Access. A Producer's Generating Facility and Interconnection Facilities shall be reasonably accessible to PG&E personnel as necessary for PG&E to perform its duties and exercise its rights under its Tariff Schedules and Rules filed with and approved by the Commission, and any agreement between PG&E and the Producer.

7. Confidentiality of Information. Any information pertaining to Generating and/or Interconnection Facilities provided to PG&E by a Producer shall be treated by PG&E in a confidential manner. PG&E shall not use information contained in the Application to propose discounted tariffs to the customer unless authorized to do so by the customer or the information is provided to PG&E by the customer through other means.

8. Prudent Operation and Maintenance Required. A Producer shall operate and maintain its Generating Facility and Interconnection Facilities in accordance with Prudent Electrical Practices and shall maintain compliance with Commission adopted standards for the Producer's particular Generation and Interconnection Facilities. Said standards shall be those in effect at the time a Producer executes the Agreement with PG&E.

9. Curtailment and Disconnection. PG&E may limit the operation and/or disconnect or require the disconnection of a Producer's Generating Facility from PG&E's Distribution System at any time, with or without notice, in the event of an Emergency or to correct Unsafe Operating Conditions. PG&E may also limit the operation and/or disconnect or require the disconnection of a Producer's Generating Facility from PG&E's Distribution System upon the provision of reasonable notice: 1) to allow for routine maintenance, repairs or modifications to PG&E's Distribution System, 2) upon PG&E's determination that a Producer's Generating Facility is not in compliance with this Rule, or 3) upon termination of the Agreement.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

C. GENERATING FACILITY APPLICATION AND INTERCONNECTION PROCESS

1. GENERATING FACILITY APPLICATION PROCESS

a. Applicant Initiates Contact with PG&E. Upon request, PG&E will provide information and documents (such as the Agreement and the Application), technical requirements, specifications, listing of Certified Equipment, application fee information, applicable rate schedules and metering requirements) in response to a potential Applicant's inquiry. Unless otherwise agreed upon, all such information shall normally be sent to an Applicant within three (3) business days following the initial request from the Applicant. PG&E will establish an individual representative as the single point of contact for the Applicant, but may allocate responsibilities among its staff to best coordinate the Interconnection of an Applicant's Generating Facility.

b. Applicant Completes an Application. All Applicants shall be required to complete and file an Application and supply any additional information requested by PG&E. The filing must include the completed Application, which may be in paper format or filed electronically, a fee for processing the Application and performing the Initial Review to be completed by PG&E pursuant to Section C.1.c. The Application and Initial Review fee shall vary with the nature of the proposed Generating Facility as follows:

Type of Generating Facility	Initial Review Fee	Supplemental Review Fee
Net Energy Metering (per Public Utilities Code Section 2827)	None	None
All Others	$800	$600

Note: Fifty percent of the fees associated with the Initial Review will be returned to the Applicant if the Application is rejected by PG&E or the Applicant retracts the Application. The Applicant may propose, and PG&E may negotiate specific costs for processing non-standard installations such as multi-units, multi-sites, or otherwise as conditions warrant. The costs for the Initial Review and the Supplemental Review contained in this Section, as well as the language provided in Sections C.1.c and C.1.d do not apply under such circumstances. Within ten (10) business days of receiving the Application, PG&E shall normally acknowledge its receipt and state whether the Application has been completed adequately. If defects are noted, PG&E and Applicant shall cooperate in a timely manner to establish a satisfactory Application.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

C. GENERATING FACILITY APPLICATION AND INTERCONNECTION PROCESS (Cont'd.)

1. GENERATING FACILITY APPLICATION PROCESS (Cont'd.)

c. PG&E Performs an Initial Review and Develops Preliminary Cost Estimates and Interconnection Requirements.

1) Upon PG&E's receipt of a satisfactorily completed Application and any additional information necessary to evaluate the Interconnection of a Generating Facility, PG&E shall perform an Initial Review using the process defined in Section I. The Initial Review determines if (a) the Generating Facility qualifies for Simplified Interconnection, (b) the Generating Facility can qualify for Interconnection subject to minimal additional requirements, or (c) it will be necessary for PG&E to perform an Interconnection Study to determine the Interconnection Requirements.

2) PG&E shall complete its Initial Review, absent any extraordinary circumstances, within 10 business days if the Application qualifies for Simplified Interconnection. If the Initial Review determines that the proposed Generating Facility can be interconnected by means of a Simplified Interconnection, PG&E will provide the Applicant with a written description of the requirements for interconnection and the Agreement pursuant to Section C.1.e.

3) If the Application does not qualify for Simplified Interconnection as submitted, the Initial Review will include a Supplemental Review as described in Section I. The Supplemental Review will provide either (a) Interconnection requirements that shall include requirements beyond those for Simplified Interconnection, and an Agreement, or (b) a cost estimate and schedule for an Interconnection Study. The Supplemental Review shall be completed, absent any extraordinary circumstances, within 20 business days of receipt of a completed Application. Payment for the Supplemental Review shall be submitted to PG&E within 10 calendar days after the results of the Supplemental Review are provided to the Applicant. (T)

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

C. GENERATING FACILITY APPLICATION AND INTERCONNECTION PROCESS (Cont'd.)

1. GENERATING FACILITY APPLICATION PROCESS (Cont'd.)

d. When Required, Applicant and PG&E Commit to Additional Interconnection Study Steps. When an Initial Review reveals that the proposed facility cannot be interconnected to PG&E's system by means of a Simplified Interconnection pursuant to the Rule, Sections D and J, (Testing and Certification Criteria), and that significant PG&E Interconnection Facilities or Distribution System improvements must be installed or made to PG&E's Distribution System to accommodate the interconnection of an Applicant's Generating Facility, PG&E and Applicant shall enter into an agreement that provides for PG&E to perform such additional studies, facility design, and engineering and to provide detailed cost estimates for fixed price or actual cost billing to the Applicant at the Applicant's expense. The Interconnection Study Agreement shall set forth PG&E's schedule for completing such work and the estimated or fixed price costs of such studies and engineering. Upon completion of an Interconnection Study, PG&E shall provide the Applicant with the specific requirements, costs and schedule for interconnecting the Generating Facility to accommodate execution of agreements pursuant to Section C.1.e. (T)

e. Applicant and PG&E Enter Into a Generation Generating Facility Interconnection Agreement and, Where Required, a Financing and Ownership Agreement for Interconnection Facilities or Distribution System Modifications. PG&E shall provide the Applicant with an executable version of the Generating Facility Interconnection Agreement, net energy metering agreement, or power purchase agreement appropriate for the Applicant's Generating Facility and desired mode of operation. Where the Initial Review or Interconnection Study performed by PG&E has determined that modifications or additions are required to be made to its Distribution System, or that additional metering, monitoring, or protection devices will be necessary to accommodate an Applicant's Generating Facility, PG&E may also provide the Applicant with other interconnection facilities financing and ownership agreements as necessary. These agreements shall set forth both PG&E and the Applicant's responsibilities, completion schedules, and estimated or fixed price costs for the required work.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

C. GENERATING FACILITY APPLICATION AND INTERCONNECTION PROCESS (Cont'd.)

1. GENERATING FACILITY APPLICATION PROCESS (Cont'd.)

f. Producer Installs or Constructs the Generating Facility; Where Applicable, PG&E or Producer Installs Required Interconnection Facilities or Modifies PG&E's Distribution System. After executing the appropriate Generating Facility Interconnection Agreement, and any other applicable agreements, such as GFIA, SSA, and where appropriate, power purchase agreements and/or natural gas agreement, the Producer may install or construct its Generating Facility in accordance with the provisions of this Rule and the terms of the specific agreements formed between the Producer and PG&E. Where appropriate, PG&E will commence construction/installation of the system modifications and/or metering and monitoring requirements which have been identified. The parties will use good faith efforts to meet schedules and fixed costs or estimated costs as appropriate. (T) | (T)

g. Producer Arranges for and Completes Testing of Generating Facility and, Where Applicable, Producer Installed Interconnection Facilities. New Generating Facilities and associated Interconnection Facilities must be tested to ensure compliance with the safety and reliability provisions of the Commission-approved rules and regulations prior to being operated in parallel with PG&E's Distribution System. Certified Equipment will be subject to the tests specified in Section D. For non-Certified Equipment, the Producer will develop a written testing plan to be submitted to PG&E for its review and acceptance. Alternatively, the Producer and PG&E may agree to have PG&E conduct the required testing at the Producer's expense. Where applicable, the test plan shall include the installation test procedure(s) published by the manufacturer(s) of the generation or interconnection equipment. Facility testing shall be conducted at a mutually agreeable time, and depending on who conducts the tests, PG&E or Producer shall be given the opportunity to witness the tests.

h. PG&E Authorizes Interconnection. The Producer's Generating Facility shall be allowed to commence parallel operation with PG&E's Distribution System upon satisfactory compliance with the terms of the Generating Facility Interconnection Agreement and other applicable agreements as described in section C.1.f. Compliance may include, but not be limited to, provision of any required documentation and satisfactorily completing any required inspections or tests as described herein or in the agreements formed between the Producer and PG&E. A Producer shall not interconnect a Generating Facility unless it has received PG&E's express written permission to do so. (T) (T)

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

C. GENERATING FACILITY APPLICATION AND INTERCONNECTION PROCESS (Cont'd.)

1. GENERATING FACILITY APPLICATION PROCESS (Cont'd.)

i. PG&E Reconciles Costs and Payments. If the Producer selected a fixed price cost for the Interconnection Facilities or Distribution System Modifications, no reconciliation will be necessary. If the Producer selected actual cost billing, a true-up will be required. Within a reasonable time after the interconnection of a Producer's Generating Facility, PG&E will reconcile its actual costs related to the Producer's facility against the generating facility application fee and any other advance payments made by the Producer. The Producer will receive either a bill for any balance due or a reimbursement for overpayment as determined by PG&E's reconciliation. The Producer shall be entitled to a reasonably detailed and understandable report detailing PG&E's reconciliation process.

D. GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS

1. GENERAL INTERCONNECTION AND PROTECTION REQUIREMENTS

a. Automatic Lockout Required. The Protective Functions shall include an automatic means to prevent the Generating Facility from re-energizing a de-energized PG&E Distribution System circuit.

b. Protective Functions Required. The Protective Functions of a Generating Facility must include an over/under voltage trip function, an over/under frequency trip function, and a means for disconnecting the Generating Facility from PG&E's Distribution System whenever a protective function initiates a trip.

c. No Unintended Islanding. The Generating Facility and associated Protective Functions shall not contribute to the formation of an Unintended Island.

d. Drawings Required. The Producer's protection and control diagrams for the interconnection shall be approved by PG&E prior to completion of the Generating Facility Interconnection unless the Producer uses a protection and control scheme previously approved by PG&E for system-wide application or uses only Certified Equipment.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

D. GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.)

1. GENERAL INTERCONNECTION AND PROTECTION REQUIREMENTS (Cont'd.)

e. Required Delay on Reconnection. Protective Functions shall be equipped with automatic means to prevent reconnection of the Generating Facility with PG&E's Distribution System unless PG&E's Distribution System service voltage and frequency is of specified settings and is stable for at least 60 seconds.

f. Certified Equipment. Certified Equipment contains certified functions that are accepted by all California Electric Corporations. Certified Equipment may be installed on PG&E's Distribution System in accordance with an interconnection control and protection scheme approved by PG&E.

g. Purpose of Protective Functions. The Protective Functions and requirements of this Rule are designed to protect PG&E's Distribution System and not the Generating Facility. A Producer shall be solely responsible for providing adequate protection for the Producer's Generating Facility and Interconnection Facilities connected to PG&E's Distribution System. The Producer's protective equipment shall not impact the operation of other protective devices utilized on PG&E's Distribution System in a manner that would affect PG&E's capability of providing reliable service to its Customers.

h. Suitable Equipment Required. Circuit breakers or other interrupting devices located at the Point of Common Coupling must be Certified or "Listed" (as defined in Article 100, the Definitions Section of the National Electrical Code) as suitable for their intended application. This includes being capable of interrupting the maximum available fault current expected at their location. The Generating Facility shall be designed so that the failure of any one device shall not potentially compromise the safety and reliability of PG&E's Distribution System.

i. Visible Disconnect Required. The Producer shall furnish and install a manual disconnect device that has a visible break to isolate the Generating Facility from PG&E's Distribution System. The device must be accessible to PG&E personnel and be capable of being locked in the open position. Generating Facilities with Non-Islanding inverters totaling one (1) kVA or less are exempt from this provision.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

D. GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS (Cont'd.)

1. GENERAL INTERCONNECTION AND PROTECTION REQUIREMENTS (Cont'd.)

j. Momentarily Paralleling Facilities Excluded. Section D of this Rule is not intended to address the requirements for Generating Facilities that parallel momentarily (60 cycles or less) or Generating Facilities that operate independently of PG&E's Distribution System.

D. INTERCONNECTION FACILITIES

2. Prevention of interference. The Producer shall not operate equipment that superimposes a voltage or current upon PG&E's Distribution System that interferes with PG&E operations, service to PG&E customers, or PG&E communication facilities. If such interference occurs, the Producer must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by PG&E. If the Producer does not take timely corrective action, or continues to operate the equipment causing interference without restriction or limit, PG&E may, without liability, disconnect the Producer's equipment from PG&E's Distribution System, in accordance with Section B.9 of this Rule. To eliminate undesirable interference caused by the operation of the Generating Facility, each Generating Unit in a Generating Facility shall meet the following criteria:

a. Normal voltage operating range. The voltage operating range for a Generating Unit shall be selected as a protection function that responds to abnormal Distribution System conditions and not as a voltage regulation function.

(1) Small systems (11 kVA or less). Generating Units connected to a Generating Facility with a Gross Nameplate capacity of 11 kVA or less shall be capable of operating within the limits normally experienced on PG&E's Distribution System. The operating window shall be selected in a manner that minimizes nuisance tripping and range between 106 volts and 132 volts (88-110% of nominal voltage) on a 120-volt base. Generating Facilities shall cease to energize PG&E lines whenever the voltage at the Point of Common Coupling deviates from the allowable voltage operating range.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

D. INTERCONNECTION FACILITIES (Cont'd.)

2. PREVENTION OF INTERFERENCE (Cont'd.) (T)

a. NORMAL VOLTAGE OPERATING RANGE (Cont'd.) (T)

2) Large Systems (greater than 11 kVA). PG&E may have specific operating voltage ranges for larger Generating Facilities, and may require adjustable operating voltage settings for these larger systems. In the absence of such requirements, the above principles of operating between 88% and 110% of the appropriate interconnection voltage should be followed.

3) Voltage Disturbances. System voltage assumes a nominal 120 V base. For the convenience of those wishing to translate these guidelines to voltage bases other than 120 volts, the limits will also be provided as approximate percentages. Generating Units should sense abnormal voltage and respond accordingly. The following conditions should be met, with voltages in RMS and measured at the Point of Common Coupling:

Table D.1

Voltage at Point of Common Coupling	Maximum Trip Time (Assuming 60 Cycles per Second)
Less than 60 Volts	10 Cycles
Greater than 60 volts but less than 106 volts	120 Cycles
Greater than 106 volts but less than 132 volts	Normal Operation
Greater than 132 volts but less than 165 volts	120 Cycles (30 Cycles for facilities greater than 11kVa)
Greater than 165 volts	6 Cycles

* "Trip time" refers to the time between the abnormal condition being applied and the Generating Facility ceasing to energize PG&E's Distribution System. Certain circuits will actually remain connected to PG&E's Distribution System to allow sensing of electrical conditions for use by the "reconnect" feature. The purpose of the allowed time delay is to ride through short-term disturbances to avoid excessive nuisance tripping. For Generating Facilities with a Gross Nameplate Rating of 11 kVA capacity or less, the above set points are to be non-user adjustable. For Generating Facilities with a Gross nameplate Rating greater than 11 kVA, different voltage set points and trip times from those in Table D.1 may be negotiated with PG&E.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

D. INTERCONNECTION FACILITIES (Cont'd.)

2. PREVENTION OF INTERFERENCE (Cont'd.) (T)

b. Flicker. Any voltage flicker at the Point of Common Coupling caused by the Generating Facility should not exceed the limits defined by the "Maximum Borderline of Irritation Curve" identified in IEEE 519 *(IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power System*s, IEEE STD 519-1992, Institute of Electrical and Electronic Engineers, Piscataway, NJ. April 1992. This requirement is necessary to minimize the adverse voltage affects experienced by other customers on PG&E's Distribution System. Induction Generating Units may be connected and brought up to synchronous speed (as an induction motor) provided these flicker limits are not exceeded.

c. Frequency. PG&E controls system frequency, and the Generating Facility shall operate in synchronism with PG&E's Distribution System. Small Generating Facilities should have a fixed operating frequency range of 59.3-60.5 Hertz. The Generating Facility must cease to energize the system in a maximum of ten cycles should PG&E remain outside of the frequency limits. The purpose of the time delay is to allow the Generating Facility to ride through short-term disturbances to avoid excessive nuisance tripping. PG&E may require adjustable operating frequency settings for Generating Facilities larger than 11 kVA to assist the system during serious capacity shortages. For Generating Facilities larger than 11 kVA, low frequency settings of 59.3 Hz and 58.0 Hz may be used with the consent of PG&E.

d. Harmonics. Harmonic distortion shall be in compliance with IEEE 519. Exception: The harmonic distortion of a Generating Facility located at a Customer's site shall be evaluated using the same criteria as the loads at that site.

e. Direct Current Injection. Generating Facilities should not inject Direct Current greater than 0.5% of rated output current into PG&E's Distribution System under either normal or abnormal operating conditions.

f. Power Factor. Each Generating Unit in a Generating Facility shall be capable of operating at some point within a range of a power factor of 0.9 (either leading or lagging). Operation outside this range is acceptable provided the reactive power of the Generating Facility is used to meet the reactive power needs of on-site loads or that reactive power is otherwise provided under tariff by PG&E. The Producer shall notify PG&E if it is using the Generating Facility for power factor correction.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

D. INTERCONNECTION FACILITIES (Cont'd.)

3. CONTROL, PROTECTION AND SAFETY EQUIPMENT REQUIREMENTS

a. BASIC REQUIREMENTS

1) Protective Function Requirements. The Protective Functions of a Generating Facility must include a visual open disconnect device (except as exempted in Section D.1.l.), a fault-interrupting device, an over/under voltage trip function, and an over/under frequency trip function. (T)

2) Limits Specific to Single-Phase Generating Facilities. For single-phase Generating Facilities connected to a shared single-phase secondary, the maximum capacity shall be 20 kVA. Generating Facilities applied on a center-tap neutral 240-volt service must be installed such that no more than 6 kVA of imbalance in capacity exists between the two sides of the 240-volt service. For dedicated distribution transformer services, the limit of a single-phase Generating Facility shall be the transformer nameplate rating. (T)

b. TECHNOLOGY SPECIFIC REQUIREMENTS

1) Three-Phase Synchronous Generating Facilities. For three phase Generating Facilities, the Generating Facility circuit breakers shall be three-phase devices with electronic or electromechanical control. The Producer shall be responsible for properly synchronizing its Generating Facility with PG&E's Distribution System by means of either a manual or automatic synchronizing function. Automatic synchronizing is required for all synchronous Generating Units, which have a Short Circuit Contribution Ratio (SCCR) exceeding 0.05. A Generating Unit whose SCCR exceeds 0.05 shall be equipped with Protective Functions suitable for detecting loss of synchronism and rapidly disconnecting the Generating Facility from PG&E's Distribution System. Unless otherwise agreed upon by the Producer and PG&E, synchronous Generating Units shall automatically regulate power factor, not voltage, while operating in parallel with PG&E's Distribution System. Power system stabilization is specifically not required for Generating Facilities under 10 MW Gross Nameplate Capacity. Synchronization means that at the time of connection, the frequency difference shall be less than 0.2 Hz, the voltage difference shall be less than 10%, and the phase angle difference shall be less than 10 degrees.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

D. INTERCONNECTION FACILITIES (Cont'd.)

3. CONTROL, PROTECTION AND SAFETY EQUIPMENT REQUIREMENTS (Cont'd.)

b. TECHNOLOGY SPECIFIC REQUIREMENTS (Cont'd.)

2) Induction Generators. Induction generator Generating Units do not require separate synchronizing equipment. Starting or rapid load fluctuations on induction generators can adversely impact PG&E's Distribution System's voltage. Corrective step-switched capacitors or other techniques may be necessary and may cause undesirable ferro resonance. When these counter measures (e.g. additional capacitors) are installed on the Producer's side of the Point of Common Coupling, PG&E must review these measures. Additional equipment may be required to resolve this problem as determined in an Interconnection Study.

3) Inverter Systems. Utility-interactive inverters do not require separate synchronizing equipment. Non-utility-interactive or "stand-alone" inverters shall not be used for parallel operation with PG&E's Distribution System.

c. Initial Review Process. Section I of this Rule defines the Initial Review process. The Initial Review process evaluates the specific characteristics of the Interconnection, including those specific to the location of the Generating Facility, and whether or not additional requirements are necessary.

d. Supplemental Generating Facility Requirements

1) Unintended Islanding for Generating Facilities that Fail the Export Screen. Generating Facilities must mitigate their potential contribution to an Unintended Island. This can be accomplished by one of the following options: (1) incorporating certified Non-Islanding control functions into the Protective Functions, (2) verifying that local loads sufficiently exceed the load carrying capability of the Generating Facility, or (3) incorporating transfer trip or an equivalent function in the Protective Functions.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

D. INTERCONNECTION FACILITIES (Cont'd.)

3. CONTROL, PROTECTION AND SAFETY EQUIPMENT REQUIREMENTS (Cont'd.)

d. SUPPLEMENTAL GENERATING FACILITY REQUIREMENTS (Cont'd.)

2) Fault Detection. A Generating Facility with an SCCR exceeding 0.1 or that does not meet any one of the options for detecting Unintended Islands in D.3.d.1. shall be equipped with Protective Functions designed to detect Distribution System faults, both line-to-line and line-to-ground, and promptly remove the Generating Facility from PG&E's Distribution System in the event of a fault. For a Generating Facility that cannot detect these faults within two seconds, transfer trip or an equivalent function may be required. Reclose-blocking of PG&E's affected recloser(s) may also be required by PG&E for Generating Facilities that exceed 15% of the peak load on the Line Section.

e. Generating Facility types and conditions not identified. In the event that Section D of this Rule does not address the interconnection requirements for a particular Generating Facility, PG&E and Producer may agree upon the technical requirements to interconnect the Generating Facility.

E. INTERCONNECTION FACILITY OWNERSHIP AND FINANCING

1. SCOPE AND OWNERSHIP OF INTERCONNECTION FACILITIES

a. Scope. The interconnection of a Producer's Generating Facility with PG&E's Distribution System is made through the use of Interconnection Facilities. Such interconnection may also require Distribution System Improvements. The nature, extent and costs of Interconnection Facilities and Distribution System Improvements shall be consistent with this Rule and determined through the Initial Review and/or Interconnection Studies described in Section C.

b. Ownership. Subject to the limitations set forth in this Rule, Interconnection Facilities which may be installed on Producer's side of the Point of Common Coupling may be owned, operated and maintained by the Producer or PG&E. Interconnection Facilities installed on PG&E's side of the Point of Common Coupling and Distribution System Improvements shall be owned, operated and maintained only by PG&E.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

E. INTERCONNECTION FACILITY OWNERSHIP AND FINANCING (Cont'd.)

2. RESPONSIBILITY OF COSTS OF INTERCONNECTING A GENERATING FACILITY

a. Study and Review Costs. A Producer shall be responsible for the reasonably incurred costs of the Initial Review and any Interconnection Studies conducted pursuant to Section C.2 of this Rule solely to explore the feasibility and determine the requirements of interconnecting a Generating Facility with PG&E's Distribution System.

b. Facility Costs. A Producer shall be responsible for all costs associated with Interconnection Facilities owned by the Producer. The Producer shall also be responsible for any costs reasonably incurred by PG&E in providing, operating, or maintaining Interconnection Facilities and Distribution System Improvements required solely for the interconnection of the Producer's Generating Facility with PG&E's Distribution System (Special Facilities). (T)

c. Separation of Costs. Should PG&E combine the installation of Interconnection Facilities, or Distribution System Improvements with modifications or additions to PG&E's Distribution System to serve other Customers or Producers, PG&E shall not include the costs of such separate or incremental facilities in the amounts billed to the Producer for the Interconnection Facilities or Distribution System Improvements required pursuant to this Rule.

3. INSTALLATION AND FINANCING OF INTERCONNECTION FACILITIES OWNED AND OPERATED BY PG&E

a. Agreement Required. Costs for Special Facilities shall be paid by the Producer pursuant to the provisions contained in the Generating Facility Interconnection Agreement. (T) Where the nature and extent of the Interconnection Facilities and Distribution System improvements warrant additional detail, the detail shall be found in a separate agreement between the Producer and PG&E ("Agreement for Installation or Allocation of Special Facilities for Parallel Operation of Nonutility-Owned Generation and/or Electrical Standby Service (Form 79-280), and its Appendix A, "Detail of Special Facilities Charges" (Form 79-702)), and PG&E's applicable Tariff Schedules and Rules for Special Facilities. (T)

b. Attachments and Modifications to Distribution System. Except as provided for in Section E.3.c. of this Rule, Interconnection Facilities connected directly to PG&E's Distribution System and Distribution System Improvements shall be provided, installed, owned and maintained by PG&E as Special Facilities. (T)

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

E. INTERCONNECTION FACILITY OWNERSHIP AND FINANCING (Cont'd.)

3. INSTALLATION AND FINANCING OF INTERCONNECTION FACILITIES OWNED AND OPERATED BY PG&E (Cont'd.)

c. Third-Party Installations. Subject to the approval of PG&E, a Producer may, at its option, employ a qualified contractor to provide and install Interconnection Facilities or Distribution System improvements to be owned and operated by PG&E. Such Interconnection Facilities and Distribution System improvements shall be installed in accordance with PG&E's design and specifications. Upon final inspection and acceptance by PG&E, the Producer shall transfer ownership of such Producer installed Interconnection Facilities or Distribution System improvements to PG&E and such facilities shall thereafter be owned and maintained by PG&E at the Producer's expense as Special Facilities. The Producer shall pay PG&E's reasonable cost of design, administration, and monitoring of the installation for such facilities to ensure compliance with PG&E's requirements. The Producer shall also be responsible for all costs, including any income tax liability, associated with the transfer of Producer installed Interconnection Facilities and Distribution System improvements to PG&E. (T)

d. Reservation of Unused Facilities. When a Producer wishes to reserve PG&E-owned Interconnection Facilities or Distribution System improvements installed and financed as Special Facilities for the Producer, but idled by a change in the operation of the Producer's Generating Facility or otherwise, Producer may elect to abandon or reserve such facilities consistent with the terms of its agreement with PG&E. If Producer elects to reserve idle Interconnection Facilities or Distribution System improvements, PG&E shall be entitled to continue to charge Electrical Producer for the costs related to the ongoing operation and maintenance of the Special Facilities. (T) (T)

e. Refund of Salvage Value. When a Producer elects to abandon the Special Facilities for which it has either advanced the installed costs or constructed and transferred to PG&E, the Producer shall, at a minimum, receive from PG&E a credit for the net salvage value of the Special Facilities. (T) (T)

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

F. METERING, MONITORING AND TELEMETRY

1. General Requirements. All Generating Facilities shall be metered in accordance with this Section F and shall meet all applicable standards of PG&E contained in PG&E's applicable Tariff Schedules and published PG&E manuals dealing with metering specifications. The requirements in this Section F do not apply to metering of Generating Facilities operating under PG&E's Net Energy Metering tariff pursuant to California Public Utilities Code Section 2827.

2. Metering by non-PG&E Parties. The ownership, installation, operation, reading, and testing of Metering for Generating Facilities shall be by PG&E except to the extent that the Commission has determined that all these functions, or any of them, may be performed by others as authorized by the Commission. (T)

3. Net Generation Metering. For purposes of monitoring Generating Facility operation for determination of standby charges and applicable non-bypassable charges as defined in PG&E's Tariff Schedules, and for Distribution System planning and operations, consistent with Section B.4 of this Rule, PG&E shall have the right to specify the type, and require the installation of, Net Generation Metering. PG&E shall require the provision of Generating Facility output data to the extent reasonably necessary to provide information for PG&E to administer its Tariff Schedules or to operate and plan its system. PG&E shall only require Net Generation Metering to the extent that less intrusive and/or more cost effective options for providing the necessary Generating Facility output data are not available. In exercising its discretion to require Net Generation Metering, PG&E shall consider all relevant factors, including but not limited to:

   a. Data requirements in proportion to need for information;

   b. Producer election to install equipment that adequately addresses PG&E's operational requirements;

   c. Accuracy and type of required metering consistent with purposes of collecting data;

   d. Cost of metering relative to the need for and accuracy of the data;

   e. The Generating Facility's size relative to the cost of the metering/monitoring;

   f. Other means of obtaining the data (e.g. Generating Facility logs, proxy data etc.);

   g. Requirements under any Generating Facility Interconnection Agreement with the Producer.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

F. METERING, MONITORING AND TELEMETRY (Cont'd.)

3. NET GENERATION METERING (Cont'd.) (T)

PG&E will report to the Commission or designated authority, on a quarterly basis, the rationale for requiring net generation equipment in each instance along with the size and location of the facility.

4. Point of Common Coupling Metering. For purposes of assessing PG&E charges for retail service, the Producer's Point of Common Coupling Metering shall be a bi-directional meter so that power deliveries to and from the Producer's site can be separately recorded. Alternately, the Producer may, at its sole option and cost, require PG&E to install multi-metering equipment to separately record power deliveries to PG&E's Distribution System and retail purchases from PG&E. Such Point of Common Coupling Metering shall be equipped or designed to prevent reverse registration.

5. Telemetering. If the nameplate rating of the Generating Facility is 1 MW or greater, Telemetering equipment at the Net Generator Metering location may be required at the Producer's expense. If the Generating Facility is interconnected to a Distribution System operating at a voltage below 10 kV, then Telemetering equipment may be required on Generating Facilities 250 kW or greater. PG&E shall only require Telemetering to the extent that less intrusive and/or more cost effective options for providing the necessary data in real time are not available. PG&E will report to the Commission or designated authority, on a quarterly basis, the rationale for requiring telemetering equipment in each instance along with the size and location of the facility.

6. Sunset Provision. Sections F.3 and F.5 are interim provisions only. PG&E shall file permanent metering requirements with the Commission on or by December 31, 2002. At that time, PG&E shall serve its application for approval of permanent metering requirements on the service list in OIR 99-10-025.

7. Location. Where PG&E-owned Metering is located on the Producer's premises, Producer shall provide, at no expense to PG&E, a suitable location for all such metering. (T) (T)

8. Costs of Metering. The Producer will bear all costs of the Metering required by this Rule, including the incremental costs of operating and maintaining the Metering. (T)

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

G. DISPUTE RESOLUTION PROCESS

1. The following procedures will apply for disputes arising from this Rule. The Commission shall have initial jurisdiction to interpret, add, delete or modify any provision of this Rule or of any agreements entered into between PG&E and the Producer to implement this tariff ("the implementing agreements") and to resolve disputes regarding PG&E's performance of its obligations under its Tariff Schedules, the implementing agreements, and requirements related to the interconnection of the Producer's Generating or Interconnection Facilities pursuant to this Rule.

2. Any dispute arising between PG&E and the Producer (individually "Party" and collectively "the Parties") regarding PG&E's performance of its obligations under its Tariff Schedules, the implementing agreements, and requirements related to the interconnection of Producer's Facilities pursuant to this Rule shall be resolved according to the following procedures.

   a) The dispute shall be reduced to writing by the aggrieved Party in a letter ("the dispute letter") to the other Party containing the relevant known facts pertaining to the dispute, the specific dispute and the relief sought, and express notice by the aggrieved Party that it is invoking the procedures under Section G.2. Within 45 calendar days of the date of the dispute letter, the Parties' authorized representatives will be required to meet and confer to try to resolve the dispute.

   b) If the Parties do not resolve their dispute within 45 calendar days after the date of the dispute letter, the dispute shall, upon demand of either party, be submitted to resolution before the Commission in accordance with the Commission's Rules of Practice and Procedure Applicable to Customer Complaints. (T) (T)

3. Pending resolution of any dispute under this Section, the Parties shall proceed diligently with the performance of their respective obligations under this Rule and the implementing agreements, unless the implementing agreements have been terminated. Disputes as to the Application and implementation of this Section shall be subject to resolution pursuant to the procedures set forth in this Section.

H. DEFINITIONS

The definitions set forth in this Section H are applicable only to this Rule and its corresponding agreements including Form 79-973, Generating Facility Interconnection Facilities Agreement, and Form 79-974, Application to Interconnect a Customer-Owned Generating Facility.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

H. DEFINITIONS (Cont'd.)

Accredited, Nationally Recognized Testing Laboratory (NRTL): A laboratory approved to perform the certification testing requirements for Generating Facilities.

Active Anti-Islanding Scheme: A control scheme installed with the Generating Facility that senses and prevents the formation of an Unintended Island.

Applicant: An Applicant applying for interconnection, under the provisions of PG&E's Rule 21 and Form 79-974, Application to Interconnect a Customer-Owned Generating Facility.

Application: (D)

Generating Facility Application: The standard Commission-approved form (Form 79-924—Application to Interconnect a Customer-Owned Generating Facility).

Certification Test: A test adopted by PG&E that verifies conformance of certain equipment with Commission-approved performance standards in order to be classified as Certified Equipment. Certification Tests are normally performed by an NRTL such as the Underwriter's Laboratory.

Certification; Certified; Certificate: The documented results of a successful Certification Testing.

Certified Equipment: Equipment used in a Generating Facility that has passed the Certification Test.

Commissioning Test: A test performed during the commissioning of all or part of a Generating Facility system to achieve one or more of the following:

? Verify specific aspects of its performance;
? Calibrate its instrumentation;
? Establish instrument or Protective Function set-points.

Customer: A Distribution Customer who receives or is entitled to receive Distribution Service through the Distribution System.

Dedicated Transformer; Dedicated Distribution Transformer: A transformer that provides Electricity Service to a single Customer. The Customer may or may not have a Generating Facility.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

H. DEFINITIONS (Cont'd.)

Distributed Generation: Electrical power generation by any means, including from stored electricity, that is interconnected to an PG&E at a Point of Common Coupling under the jurisdiction of the Commission.

Generating Unit: An individual electrical generator or generating system (including required equipment, appurtenances, protective equipment and structures) that is connected to and made a part of a Generating Facility.

Distribution Service: All services required by, or provided to, a Customer pursuant to the approved Tariff Schedules and Rules of PG&E.

Distribution System: All electrical wires, equipment, and other facilities owned or provided by PG&E by which PG&E provides Distribution Service to its Customers.

Distribution System Island: A condition on PG&E's Distribution System in which one or more Generating Unit(s), over which PG&E has no direct control, and a portion of PG&E's Distribution System operate while isolated from the remainder of PG&E's Distribution System.

(L)

Producer:

(L)

Emergency: An actual or imminent condition or situation, which jeopardizes PG&E's Distribution System Integrity.

Field Testing: Testing performed in the field to determine whether equipment meets PG&E's requirements for safe and reliable Interconnection

Generating Facility: All Generating Units that are included in a Generating Facility Interconnection Agreement.

Gross Nameplate Rating: The gross generating capacity of a Generating Unit or the total of the gross generating capacity of the Generating Units comprising a Generating Facility as designated by the manufacturer(s) of the Generating Unit(s).

Host Load: Electrical power that is consumed by the Customer at the property on which the Generating Facility is located.

Initial Operation: The first time the Generating Facility is in Parallel Operation.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

H. DEFINITIONS (Cont'd.)

Initial Review: The review by PG&E, following receipt of an Generating Facility Application, to determine the following: If an Generating Facility Application qualifies for Simplified Interconnection, or If an Generating Facility Application can be made to qualify for Interconnection with supplemental review determining any potential additional requirements, or If an Interconnection Study is required, the cost estimate and schedule for performing the Interconnection Study

In-rush Current: The current drawn by the Generating Facility during startup.

Interconnection Agreement: An agreement between PG&E and the Producer that gives each the certain rights and obligations to effect or end Interconnection. (T) (T)

Interconnection Study: A study to establish the requirements for Interconnection of a Producer.

Interconnection; (Interconnected): The physical connection of a Generating Facility in accordance with the requirements of these rules so that Parallel Operation with PG&E system can occur (has occurred).

Interconnection Facilities: The electrical wires, switches and related equipment that interconnect a Generating Facility to PG&E's Distribution System.

Island; Islanding: A condition on PG&E's Distribution System in which one or more Generating Facilities deliver power to Customers using a portion of PG&E's Distribution System that is electrically isolated from the remainder of PG&E's Distribution System.

ISO: The California Independent System Operator, responsible for the management of electrical power flow through California's electrical transmission network.

Line Section: That portion of PG&E's Distribution System connected to a Customer bounded by automatic sectionalizing devices or the end of the line.

Metering Equipment: All equipment, hardware, software including meter cabinets, conduit, etc. that is necessary for Metering.

Metering: The measurement of electrical power flow in kW and/or kWh, and, if necessary, kVAR at a point, and its display to PG&E, as required by this Rule.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

H. DEFINITIONS (Cont'd.)

Net Energy Metering: Metering for the mutual purchase and sale of electricity between the Producer and PG&E pursuant to the net metering tariff approved by the Commission.

Net Generation Metering: The Metering of the net electrical energy output in kW and kWh from a given Generating Facility. This may also be the measurement of the difference between the total electrical energy produced by a Generating Unit and the electrical energy consumed by the auxiliary equipment necessary to operate the Generating Unit. For a Generating Unit with no Host Load and/or Section 218 Load, Metering that is located at the point of Common Coupling. For a Generating Unit with Host Load and/or Section 218 Load, Metering that is located at the Generating Unit bus after the point of auxiliary load(s) and prior to serving Host Load and/or Section 218 Load.

Net Metering: Where electricity at a point may flow in both directions, the measurement of the net, or the algebraic sum, of electrical energy in kWh, that flows through that point in a given time-interval. Net Metering typically uses two meters, or in some cases a single meter with two or more registers, to individually measure a Customer's electric deliveries to, and consumption of retail service from, PG&E's Distribution System. Over a given time frame (typically a month) the difference between these two values yield either net consumption or net surplus. The meter registers are ratcheted to prevent reverse registration. If available, a single meter may be allowed spin backward to yield the same effect as a two meter (or register) arrangement.

Net Nameplate Rating: The gross generating capacity of a Generating Unit or the total of the gross generating capacity of the Generating Units comprising a Generating Facility as designated by the manufacturer(s) of the Generating Unit(s) minus the consumption of electrical power of the Generating Unit(s).

Network Service: More than one electrical feeder providing Distribution Service at a Point of Common Coupling.

Non-Exporting: Designed to prevent the transfer of electrical energy from the Generating Facility to PG&E.

Non-Islanding: Designed to detect and disconnect from a stable Unintended Island with matched load and generation. Reliance solely on under/over voltage and frequency trip is not considered sufficient to qualify as Non-Islanding.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

H. DEFINITIONS (Cont'd.)

Parallel Operation: The simultaneous operation of a Generating Facility with power delivered or received by PG&E while Interconnected. For the purpose of this Rule, Parallel Operation includes only those Generating Facilities that are so interconnected with PG&E's Distribution System for more than 60 cycles (one second).

Periodic Test: A test performed on part or all of a Generating Facility at pre-determined time or operational intervals to achieve one or more or the following: 1) Verify specific aspects of its performance, 2) Calibrate instrumentation, 3) Verify and re-establish instrument or Protective Function set-points.

Point of Common Coupling Metering: Metering located at the Point of Common Coupling. This is the same Metering as Net Generation Metering for Generating Facilities with no Host Load and/or Section 218 Load.

Point of Common Coupling (PCC): The transfer point for electricity between the electrical conductors of PG&E and the electrical conductors of the Producer.

Point of Interconnection: The electrical transfer point between a Generating Facility and the electrical distribution system. This may or may not be coincident with the Point of Common Coupling.

Production Test: A test performed on each device coming off the production line to verify certain aspects of its performance.

Protective Function(s): The equipment, hardware and/or software in a Generating Facility (whether discrete or integrated with other functions) whose purpose is to protect against Unsafe Operating Conditions.

Producer: The entity that executes a Generating Facility Interconnection Agreement with PG&E. The Producer may or may not own or operate the Generating Facility, but it responsible for the rights and obligations related to the Generating Facility Interconnection Agreement. (L) | | (L)

Prudent Electrical Practices: Those practices, methods, and equipment, as changed from time to time, that are commonly used in prudent electrical engineering and operations to design and operate electric equipment lawfully and with safety, dependability, efficiency, and economy.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

H. DEFINITIONS (Cont'd.)

Scheduled Operation Date: The date specified in the Generating Facility Interconnection Agreement when the Generating Facility is, by the Producer's estimate, expected to begin Initial Operation.

Secondary Network: A network supplied by several primary feeders suitably interlaced through the area in order to achieve acceptable loading of the transformers under emergency conditions and to provide a system of extremely high service reliability. Secondary networks usually operate at 600 V or lower.

Section 218 Load: Electrical power that is supplied in compliance with California Public Utilities Code section 218 (PU Code 218). PU Code 218 defines an "Electric Corporation" and provides conditions under which a transaction involving a Generating Facility would not classify a Producer as an Electric Corporation. These conditions relate to "over-the-fence" sale of electricity from a Generating Facility without using PG&E's Distribution System.

Simplified Interconnection: Interconnection conforming to the minimum requirements under this rule, as determined by Section I. (T)

Short Circuit Contribution Ratio (SCCR): The ratio of the Generating Facility's short circuit contribution to PG&E's short circuit contribution for a three-phase fault at the high voltage side of the distribution transformer connecting the Generating Facility to PG&E's system.

Special Facilities: Special Facilities are (a) facilities requested by the Producer which are in addition to or in substitution for standard facilties which PG&E would normally provide for delivery of servivce at one point, through one meter, at one voltage class under its tariff schedules, or (b) a pro rata portion of the facilities requested by an applicant, allocated for the sole use of such applicant, which would not normally be allocated for such sole use. Unless otherwise provided by PG&E's filed tariff schedules, Special Facilities will be installed, owned and maintained or allocated by PG&E as an accommodation to the Producer only if acceptable for operation by PG&E and the reliability of service to PG&E's other customers is not impaired. (N)

Stability: The return to normalcy of an PG&E Distribution System, following a disturbance. Stabilization is usually measured as a time period during which voltage and frequency are within acceptable ranges.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

H. DEFINITIONS (Cont'd.)

Starting Voltage Drop: The percentage voltage drop at a specified point resulting from In-rush Current. The SVD can also be expressed in volts on a particular base voltage, (e.g. 6 volts on a 120-volt base, yielding a 5% drop).

System Integrity: The condition under which a Distribution System is deemed safe and can reliably perform its intended functions in accordance with the safety and reliability rules of PG&E.

Telemetering: The electrical or electronic transmittal of Metering data on a real-time basis to PG&E. (L)

Type Test: A test performed on a sample of a particular model of a device to verify specific aspects of its design, construction and performance.

Unintended Island: The creation of an island, usually following a loss of a portion of PG&E's Distribution System, without the approval of PG&E.

Unsafe Operating Conditions: Conditions that, if left uncorrected, could result in harm to personnel, damage to equipment, loss of System Integrity or operation outside pre-established parameters required by the Generating Facility Interconnection Agreement. (L)

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

I. INITIAL REVIEW PROCESS FOR APPLICATIONS TO INTERCONNECT GENERATING FACILITIES

1. INTRODUCTION

This Initial Review Process was developed to create a path for selection and rapid approval for the interconnection of those Generating Facilities that do not require an Interconnection Study.

2. PURPOSE

The Initial Review determines:

a. If Generating Facility qualifies for Simplified Interconnection;

b. If a Generating Facility can be made to qualify for Interconnection with a supplemental review determining any potential additional requirements, or

c. If an Interconnection Study is required, the cost estimates and schedule for performing the Interconnection Study.

Note: Failure to pass any screen of the Initial Review means only that further review and/or studies are required before the Generating Facility can be approved for interconnection with PG&E's Distribution System. It does not mean that the Generating Facility cannot be interconnected.

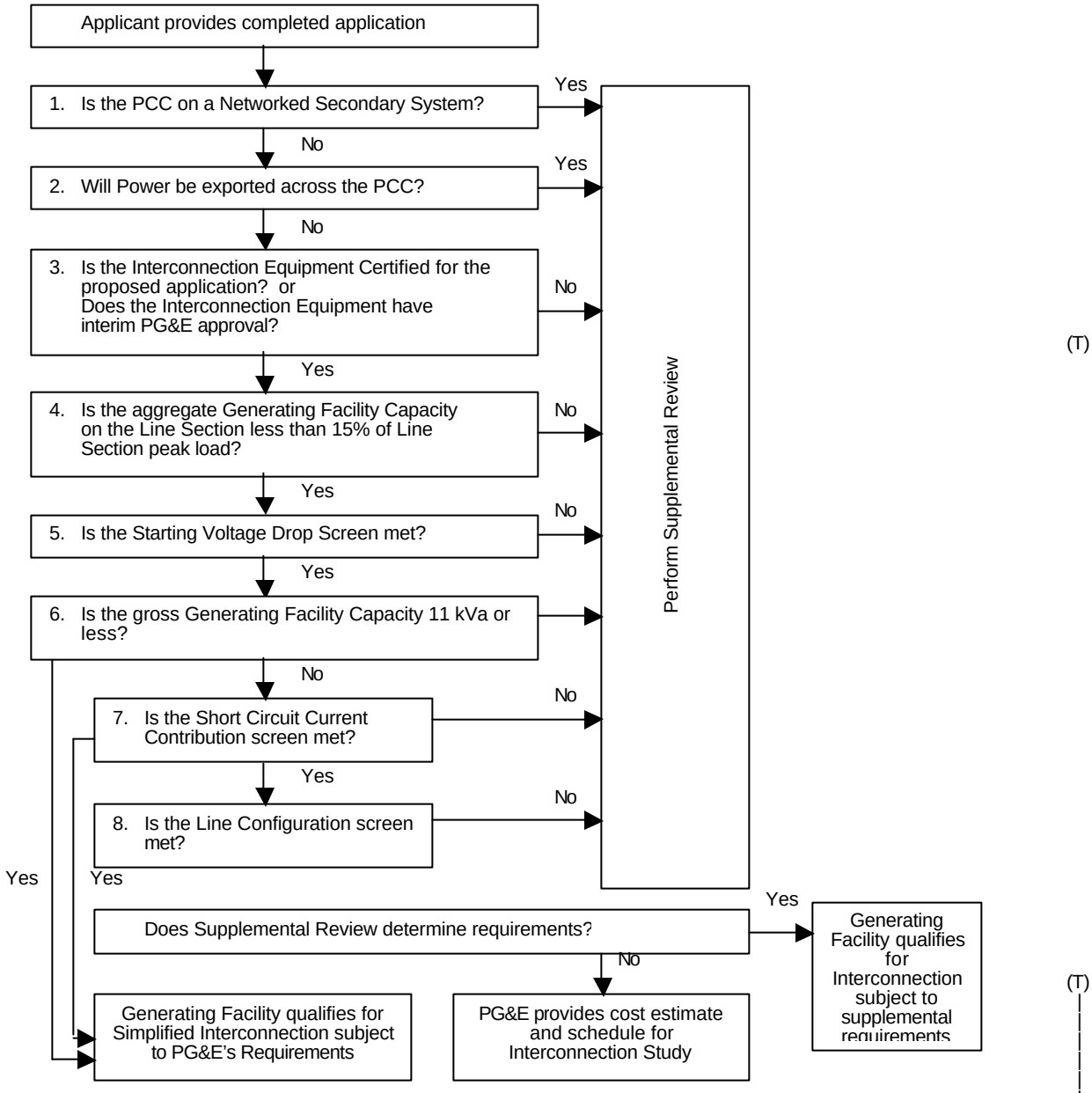
(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

I. INITIAL REVIEW PROCESS FOR APPLICATIONS TO INTERCONNECT GENERATING FACILITIES (Cont'd.)

2. PURPOSE (Cont'd.)

Initial Review Process Flow Chart



(T)

(T)

(T)

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

I. INITIAL REVIEW PROCESS FOR APPLICATIONS TO INTERCONNECT GENERATING FACILITIES (Cont'd.)

3. INITIAL REVIEW PROCESS DETAILS

a. Is the PCC on a Networked Secondary System?

?? If No, continue to next screen.
?? If Yes, Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.

Significance: Special considerations must be given to Generating Facilities proposed to be installed on networked secondary distribution systems because of the design and operational aspects of network protectors. There are no such considerations for radial distribution systems.

4. WILL POWER BE EXPORTED ACROSS THE PCC?

? If No, Generating Facility must incorporate one of the following four options:

Option 1: To insure power is never exported, a reverse power Protective Function must be implemented at the PCC. Default setting shall be 0.1% (export) of transformer rating, with a maximum 2.0 second time delay.

Option 2: To insure at least a minimum import of power, an under-power Protective Function must implemented at the PCC. Default setting shall be 5% (import) of Generating Facility Gross Nameplate Rating, with maximum 2.0 second time delay.

Option 3: To limit the incidental export of power, all of the following conditions must be met: a) The aggregate capacity of the Generating Facility must be no more than 25% of the nominal ampere rating of the Producer's service equipment; b) The aggregate capacity of the Generating Facility capacity must be no more than 50% of the Producer's service transformer rating (This capacity requirement does not apply to customers taking primary service without an intervening transformer); c) The Generating Facility must be certified as Non-Islanding. (T) (T)

Option 4: To insure that the relative size (capacity) of the Generating Facility compared to facility load results in no export of power without the use of additional devices, the Generating Facility capacity must be no greater than 50% of the Producer's verifiable minimum load.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

I. INITIAL REVIEW PROCESS FOR APPLICATIONS TO INTERCONNECT GENERATING FACILITIES (Cont'd.)

4. WILL POWER BE EXPORTED ACROSS THE PCC? (Cont'd.) (T)

Continue to next screen.

?? If Yes, Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.

Significance:

a. If it can be assured that the Generating Facility will not export power, PG&E's Distribution System does not need to be studied for load-carrying capability or Generating Facility power flow effects on PG&E voltage regulators as the Generating Facility will simply be reducing load on PG&E's Distribution System.

b. This Screen permits the use of reverse-power relaying at the PCC as positive Anti-Islanding protection.

5. IS THE INTERCONNECTION EQUIPMENT CERTIFIED FOR THE APPLICATION OR DOES THE INTERCONNECTION EQUIPMENT HAVE INTERIM PG&E APPROVAL?

?? If Yes, continue to next screen.
?? If No, Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.

Significance:

If the Generating Facility has been Certified or previously approved by PG&E, PG&E does not need to repeat its review and/or test of the Generating Facility's Protective Functions scheme. Site Commissioning Testing may still be required to insure that the system is connected properly and that the protective functions are working properly.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

I. INITIAL REVIEW PROCESS FOR APPLICATIONS TO INTERCONNECT GENERATING FACILITIES (Cont'd.)

5. IS THE INTERCONNECTION EQUIPMENT CERTIFIED FOR THE APPLICATION OR DOES THE INTERCONNECTION EQUIPMENT HAVE INTERIM PG&E APPROVAL? (Cont'd.) (T) | (T)

Certification or PG&E approval indicates the following criteria have been tested and verified:

- ?? Basic protective function requirements met.
- ?? Harmonic distortion limits met.
- ?? Synchronizing requirements met.
- ?? Power Factor regulation requirements met.
- ?? Non-Islanding requirements met.
- ?? If used, reverse power function requirement met.
- ?? If used, under-power function requirement met.

6. IS THE AGGREGATE GENERATING FACILITY CAPACITY ON THE LINE SECTION LESS THAN 15% OF LINE SECTION PEAK LOAD?

- ?? If Yes, continue to next screen.
- ?? If No, Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review to determine cumulative impact on Line Section.

Significance:

a. Low penetration of Generating Facility installations will have a minimal impact on the operation and load restoration efforts of PG&E's Distribution System.

b. The operating requirements for a high penetration of Generating Facilities may be different since the impact on PG&E's Distribution System will no longer be minimal, therefore requiring additional study or controls.

7. IS THE STARTING VOLTAGE DROP SCREEN MET?

- ?? If Yes, continue to next screen.
- ?? If No, Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.

Note: This screen only applies to Generating Facilities that start by motoring the Generating Unit(s).

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

I. INITIAL REVIEW PROCESS FOR APPLICATIONS TO INTERCONNECT GENERATING FACILITIES (Cont'd.)

7. IS THE STARTING VOLTAGE DROP SCREEN MET? (Cont'd.) (T)

PG&E has two options in determining whether Starting Voltage Drop could be a problem. The option to be used is at PG&E's discretion:

Option 1: PG&E may determine that the Generating Facility's starting Inrush Current is equal to or less than the continuous ampere rating of the Producer's Service Equipment. (T)

Option 2: PG&E may determine the impedances of the service distribution transformer (if present) and the secondary conductors to Producer's Service Equipment and perform a voltage drop calculation. Alternatively, PG&E may use tables or monographs to determine the voltage drop. Voltage drops caused by starting a Generating Unit as a motor must be less than 2.5% for primary interconnections and 5% for secondary interconnections.

Significance:

a. This screen addresses potential voltage fluctuation problems for Generating Units that start by motoring.

b. When starting, Generating Facilities should have minimal impact on the service voltage to other PG&E Customers.

c. Passing this screen does not relieve the Producer from ensuring that its Generating Facility complies with the flicker requirements of Rule 21, Section 4.

8. IS THE GROSS NAMEPLATE CAPACITY OF THE GENERATING FACILITY 11 KVA OR LESS?

?? If Yes, Generating Facility qualifies for Simplified Interconnection. Skip remaining screens.

?? If No, continue to next screen.

Significance:

The Generating Facility will have a minimal impact on fault current levels and any potential line overvoltages from loss of system neutral grounding.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

I. INITIAL REVIEW PROCESS FOR APPLICATIONS TO INTERCONNECT GENERATING FACILITIES (Cont'd.)

9. IS SHORT CIRCUIT CURRENT CONTRIBUTION SCREEN MET?

?? If Yes, continue to next screen.

?? If No, Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.

The Short Circuit Current Contribution Screen consists of two criteria; both of which must be met when applicable:

a. When measured at primary side (high side) of a Dedicated Distribution Transformer serving a Generating Facility, the sum of the Short Circuit Contribution Ratios (SCCR) of all generating facilities connected to the particular Distribution System circuit that serves the Generating Facility must be less than or equal to 0.1.

b. When measured at the secondary side (low side) of a shared distribution transformer, the short circuit contribution of the proposed Generating Facility must be less than or equal to 2.5% of the interrupting rating of the Producer's Service Equipment.

Significance:

If the Generating Facility passes this screen it can be expected that it will have no significant impact on PG&E's Distribution System's short circuit duty, fault detection sensitivity, relay coordination or fuse-saving schemes

10. IS THE LINE CONFIGURATION SCREEN MET?

?? If Yes, Generating Facility qualifies for Simplified Interconnection. Skip remaining screens.

?? If No, then Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.

Line Configuration Screen: Identify primary distribution line configuration that will serve the proposed Generating Facility. Based on the type of interconnection to be used for the Generating Facility, determine from table if the proposed Generating Facility passes the screen.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

I. INITIAL REVIEW PROCESS FOR APPLICATIONS TO INTERCONNECT GENERATING FACILITIES (Cont'd.)

10. IS THE LINE CONFIGURATION SCREEN MET? (Cont'd.) (T)

Primary Distribution Line Type	Type of Interconnection to be made to Primary Distribution Line	Results/Criteria
Three-phase, three wire	Any type	Pass Screen
Three-phase, four wire or line-to-neutral	Single-phase	Pass Screen
Three-phase, four wire (For any line that has such a section OR mixed 3 wire & 4 wire)	All Others	To pass, aggregate Generating Facility Capacity must be less than or equal to 10% of Line Section Peak Load

Significance:

If the primary distribution circuit serving the Generating Facility is of a "three-wire" type, or if the Generating Facility's interconnection transformer is single-phase and connected in a line-to-neutral configuration, then there is no concern about overvoltages to PG&E's, or other Customer's equipment caused by loss of system neutral grounding during the operating time of Anti-Islanding protection.

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA

1. INTRODUCTION

This Section describes the test procedures and requirements for equipment used for the Interconnection of Generating Facilities to PG&E's Distribution System. Included are Type Testing, Production Testing, Commissioning Testing, and Periodic Testing. The procedures listed rely heavily on those described in appropriate Underwriters Laboratory (UL), Institute of Electrical and Electronic Engineers (IEEE), and International Electrotechnical Commission (IEC) documents—most notably UL 1741 and IEEE 929, as well as the testing described in *May 1999 New York Standardized Interconnection Requirements.* These procedures and requirements were developed prior to the completion of IEEE P1547 *Standard for Distributed Resources Interconnected with Electric Power System*s, and should be revisited once that standard is published. (T)

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

1. INTRODUCTION (Cont'd.)

The tests described here, together with the technical requirements in Section D of this Rule, are intended to provide assurance that the Generating Facility's equipment will not adversely affect PG&E's Distribution System and that a Generating Facility will cease providing power to PG&E's Distribution System under abnormal conditions. The tests were developed assuming a low level of Generating Facility penetration or number of connections to PG&E's Distribution System. At high levels of Generating Facility penetration, additional requirements and corresponding test procedures may need to be defined.

This test specification also provides a means of "certifying" equipment. Once a Generating Unit or device has been Certified per this Certification process, it may be considered to be suitable for use as part of a Generating Facility interconnected with PG&E's Distribution System. Subject to the exceptions described in this Appendix, PG&E will not require a Producer to repeat the design review or test the Protective Functions of equipment that has been Certified. It should be noted the Certification process is intended to facilitate Generating Facility interconnections. Certification is not a prerequisite to interconnect a Generating Facility. The use of non-certified equipment may be acceptable to PG&E subject to testing and approval by PG&E as discussed below.

2. CERTIFICATION CRITERIA

Equipment tested and approved (e.g. "Listed") by an accredited, nationally recognized testing laboratory ("NRTL") as having met both the Type Testing and Production Testing requirements described in this document is considered to be "Certified Equipment" for purposes of Interconnection with PG&E's Distribution System. Certification may apply to either a pre-packaged system or an assembly of components that address the necessary functions. Type Testing may be done in the manufactures' factory or test laboratory, or in the field. At the discretion of the testing laboratory, field-certification may apply only to the particular installation tested. In such cases, some or all of the tests may need to be repeated at other installations.

For non-certified equipment, some or all of the tests described in this document may be required by PG&E for each Generating Facility installation. The manufacturer or another laboratory acceptable to PG&E may perform these tests. Test results for non-certified equipment must be submitted to PG&E as part of the application process for PG&E's review and approval under the supplemental review. Approval by PG&E for equipment used in a particular application does not guarantee PG&E's approval for use in other applications or by other California Electric Corporations.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

2. CERTIFICATION CRITERIA (Cont'd.)

When equipment is Certified by a NRTL, the NRTL shall provide to the manufacturer, at a minimum, a certificate with the following information for each device:

a. ADMINISTRATIVE

1) The effective date of certification or applicable serial number (range or first in series), and/or other proof that certification is current
2) Equipment model number(s) of the Certified equipment
3) The software version utilized in the equipment, if applicable
4) Test procedures specified (including date or revision number)
5) Laboratory accreditation (by whom and to what standard)

b. TECHNICAL (AS APPROPRIATE)

1) Device ratings (kW, kVA, Volts, Amps, etc.)
2) Maximum available fault current in Amps
3) In-rush Current in Amps
4) Trip points, if factory set (trip value and timing)
5) Trip point and timing ranges for adjustable settings
6) Nominal power factor or range if adjustable
7) If the device/system is certified for non-export and the method used (reverse power or under power)
8) If the device/system is Certified as Non-Islanding (D)

It is the responsibility of the equipment manufacturer to ensure that certification information is made publicly available by the manufacturer, the testing laboratory, or by a third party.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

3. TYPE TESTING

a. INVERTERS

Static power inverters shall meet all of the Type Tests and requirements appropriate for a utility interactive inverter as specified in UL 1741 *Static Inverters and Charge Controllers for Use in Photovoltaic Power System*s, and listed in Table 1 below. These requirements may be applied to inverters used with electric energy sources other than photovoltaic ("PV") systems. The specific section number from the May 1999 version of UL1741 is provided for each test and requirement. Section titles were added for clarity. These section numbers are subject to change by UL. A revised version of 1741 is expected to be published around November, 2000. The utility interconnection-related procedures and requirements of that version will need to be reviewed to determine if they should be adopted into these testing and certification rules.

The requirements described below cover only issues related to Interconnection and are not intended to address device safety or other issues outside the needs of the relationship between PG&E and a Producer operating a Generating Facility.

Table 1, UL1741 (May 1999 Version)
Type Tests and Requirements Appropriate for Utility Interactive Inverter Systems

Section Number	Section Title
39.1	Utility Disconnect Switch
39.2	Field Adjustable Trip-points
39.3	Field Adjustable Trip-points
39.4	Field Adjustable Trip-points
39.5	Field Adjustable Trip-points, Marking
40.1	DC Isolation
41.2	Simulated PV Array (Input Source) requirements
44	Dielectric Voltage Withstand Test
45.2.2	Power Factor
45.4	Harmonic Distortion
45.5	DC Injection
46.2	Utility Voltage and Frequency Variation Test

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

3. TYPE TESTING (Cont'd.)

a. INVERTERS (Continued)

Table 1, UL1741 (May 1999 Version) Continued
Type Tests and Requirements Appropriate for Utility Interactive Inverter Systems

Section Number	Section Title
46.2.3	Reset Delay
46.4	Loss of Control circuit
47.3	Short Circuit Test
47.7	Load Transfer Test

A description of key aspects of these procedures is provided in the testing procedures section of this Appendix.

Separate test procedures are provided to certify Non-Islanding functions (Section J.3.d.) and non-export functions (Section J.3.e.), to determine the In-rush Current tolerance of the Distribution System (Section J.3.f.), to subject the device to voltage surge conditions (Section J.3.g.), and to verify the inverter's ability to synchronize with the Distribution System (Section J.3.h.).

b. SYNCHRONOUS GENERATORS

Until a standardized test procedure, written specifically for synchronous generators, is identified, PG&E or an NRTL shall determine which of the tests described in this Section are appropriate and necessary to certify the performance of the control and protection system functions of the synchronous machine, and how to perform them. The following tests listed in Table 2 and defined in UL 1741, shall be performed as applicable to a synchronous generator. (T)

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

3. TYPE TESTING (Cont'd.)

b. SYNCHRONOUS GENERATORS (Cont'd.) (T)

Table 2, UL1741 (May 1999 Version)
Type Tests and Requirements Appropriate for Synchronous Generators

Section Number	Section Title
39.1	Utility Disconnect Switch
39.2	Field Adjustable Trip-points
39.3	Field Adjustable Trip-points
39.4	Field Adjustable Trip-points
39.5	Field Adjustable Trip-points, Marking
44	Dielectric Voltage Withstand Test
45.2.2	Power Factor
45.4	Harmonic Distortion
46.2	Utility Voltage and Frequency Variation Test
46.2.3	Reset Delay
46.4	Loss of Control circuit
47.3	Short Circuit Test

A description of key aspects of these procedures is provided in the testing procedures section of this Appendix.

Separate test procedures are provided to certify Non-Islanding functions (Section J.3.d.) and non-export functions (Section J.3.e.), to determine the In-rush Current tolerance of the Distribution System (Section J.3.f.), to subject the device to voltage surge conditions (Section J.3.g.), and to verify the inverter's ability to synchronize with the Distribution System (Section J.3.h.).

c. INDUCTION GENERATORS

Until a standardized test procedure, written specifically for induction generators is identified, PG&E or an NRTL shall determine which of the tests described in this Section are appropriate and necessary to certify the performance of the control and protection system functions of the induction generator, and how to perform them. The following tests listed in Table 3 and defined in UL 1741, shall be performed as applicable to a induction generator. (T)

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

3. TYPE TESTING (Cont'd.)

c. INDUCTION GENERATORS (Cont'd.) (T)

Table 3, UL1741 (May 1999 Version)
Type Tests and Requirements Appropriate for Induction Generators

Section Number	Section Title
39.1	Utility Disconnect Switch
39.2	Field Adjustable Trip-points
39.3	Field Adjustable Trip-points
39.4	Field Adjustable Trip-points
39.5	Field Adjustable Trip-points, Marking
44	Dielectric Voltage Withstand Test
45.2.2	Power Factor
45.4	Harmonic Distortion
46.2	Utility Voltage and Frequency Variation Test
46.2.3	Reset Delay
46.4	Loss of Control circuit
47.3	Short Circuit Test
47.7	Load Transfer Test

A description of key aspects of these procedures is provided in the testing procedures section of this Appendix.

Separate test procedures are provided to certify Non-Islanding functions (Section J.3.d.) and non-export functions (Section J.3.e.), to determine the In-rush Current tolerance of the Distribution System (Section J.3.f.), to subject the device to voltage surge conditions (Section J.3.g.).

d. ANTI-ISLANDING TEST

In addition to the above Type Tests, devices that pass the Anti-Islanding test procedure described in this document will be considered Non-Islanding for the purposes of PG&E's interconnection requirements.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

3. TYPE TESTING (Cont'd.)

e. NON-EXPORT TEST

In addition to the above Type Tests, devices that pass the Non-Export test procedure described in Section J.7.a. will be considered Non-Exporting for the purposes of PG&E's interconnection requirements.

f. IN-RUSH CURRENT TEST

Generation equipment that utilizes PG&E power to motor up to speed will be tested using the procedure defined in Section J.7.b. to determine the maximum current drawn during this startup process. The resulting In-rush Current is used to estimate the starting voltage drop.

g. SURGE WITHSTAND CAPABILITY TEST

Interconnection equipment shall be tested for surge withstand capability (SWC), both oscillatory and fast transient, in accordance with the test procedure defined in IEEE/ANSI C62.45 using the peak values defined in IEEE/ANSI C62.41 Tables 1 and 2 for location category B3. An acceptable result occurs even if the device is damaged by the surge, but is unable to operate or energize PG&E's Distribution System. If the device remains operable after being subject to the surge conditions, previous type tests related to PG&E's protection and power quality will need to be repeated to ensure the unit will still pass those tests following the surge test.

h. SYNCHRONIZATION TEST

This test verifies that the unit synchronizes within the specified voltage/frequency/phase angle requirements. It is applied to synchronous generators and inverters capable of operating as voltage-source while connected to the PG&E. This test is not necessary for induction generators or current-source inverters. The test will start with only one of the three parameters: 1) voltage difference between Generating Facility and PG&E's Distribution System, 2) frequency difference, or 3) phase angle outside of the synchronization specification. Initiate the synchronization routine and verify that the Generating Facility is brought within specification prior to synchronization. Repeat the test five times for each of the three parameters. For manual synchronization with synch check or manual control with auto synchronization, the test must verify that paralleling does not occur until the parameters are brought within specifications.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

4. PRODUCTION TESTING

As a minimum, the Utility Voltage and Frequency Variation Test procedure described in UL1741 under Manufacturing and Production Tests, Section 68 shall be performed as part of routine production (100 percent) on all equipment used to interconnect Generating Facilities to PG&E's Distribution System. This testing may be performed in the factory or as part of a Commissioning Test (Section J.5.a.).

5. COMMISSIONING TESTING

Commissioning Testing, where required, will be performed on-site to verify protective settings and functionality. Upon initial Parallel Operation of a Generating Facility, or any time interface hardware or software is changed that may affect the functions listed below, a Commissioning Test must be performed. An individual qualified in testing protective equipment (professional engineer, factory-certified technician, or licensed electrician with experience in testing protective equipment) must perform Commissioning Testing in accordance with the manufacturer's recommended test procedure to prove the settings and requirements of this document. PG&E has the right to witness Commissioning Tests as described below, or to require written certification by the installer describing which tests were performed and their results. Functions to be tested during commissioning, particularly with respect to non-certified equipment, may consist of the following: (T)

? Over and under-voltage
? Over and under-frequency
? Anti-Islanding function (if applicable)
? Non-Export function (if applicable)
? Inability to energize dead line
? Time delay on restart after utility source is stable
? Utility system fault detection (if used)
? Synchronizing controls (if applicable)
? Other interconnection protective functions that may be required as part of the Generating Facility Interconnection Agreement (T)

Other checks and tests that may need to be performed include: (T)

? Verifying final protective settings
? Trip test (T)
? In-service test

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

5. COMMISSIONING TESTING (Cont'd)

a. CERTIFIED EQUIPMENT

Generating Facilities qualifying for Simplified Interconnection incorporate Certified Equipment that have, at a minimum, passed the Type Test and Production Tests described in this document and are judged to have little or no potential impact on PG&E's Distribution System. For such Generating Facilities, it is necessary to perform only the following tests:

1) Protection settings that have been changed after factory testing will require field verification. Tests will be performed using injected secondary quantities, applied waveforms, a test connection using a generator to simulate abnormal utility voltage or frequency, or varying the set points to show that the device trips at the measured (actual) utility voltage or frequency.

2) The Non-Islanding function will be checked by operating a load break disconnect switch to verify the interconnection equipment ceases to energize the line and does not re-energize for the required time delay after the switch is closed.

3) The Non-Export function will be checked using secondary injection techniques. This function may also be tested by adjusting the Generating Facility output and local loads to verify that the applicable non-export criteria (i.e., reverse power or under power) are met.

The supplemental review or an Interconnection Study may impose additional components or additional testing.

b. NON-CERTIFIED EQUIPMENT

Non-certified equipment shall be subjected to the appropriate tests described in Type Testing (Section J.3.) as well as those described in Certified Equipment Commissioning Test (Section J.5.a.). With PG&E's approval, these tests may be performed in the factory, in the field as part of commissioning, or a combination of both. PG&E, at its discretion, may also approve a reduced set of tests for a particular application or, for example, if it determines it has sufficient experience with the equipment.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

5. COMMISSIONING TESTING (Cont'd)

c. VERIFICATION OF SETTINGS

Verifying final protective settings If the testing is part of the commissioning process, then, at the completion of such testing, the Producer shall confirm all devices are set to PG&E-approved settings . This step shall be documented in the Commissioning Test Certification.

d. TRIP TESTS

Interconnection protective devices (e.g. reverse power relays) that have not previously been tested as part of the interconnection system with their associated interrupting devices (e.g. contactor or circuit breaker) shall be trip tested during commissioning. The trip test shall be adequate to prove that the associated interrupting devices open when the protective devices operate. Interlocking circuits between protective devices or between interrupting devices shall be similarly tested unless they are part of a system that has been tested and approved during manufacture.

e. IN-SERVICE TESTS

Interconnection protective devices that have not previously been tested as part of the interconnection system with their associated instrument transformers or that are wired in the field shall be given an in-service test during commissioning. This test will verify proper wiring, polarity, CT/PT ratios, and proper operation of the measuring circuits. The in-service test shall be made with the power system energized and carrying a known level of current. A measurement shall be made of the magnitude and phase angle of each ac voltage and current connected to the protective device and the results compared to expected values. For protective devices with built-in metering functions that report current and voltage magnitudes and phase angles, or magnitudes of current, voltage, and real and reactive power, the metered values may be used for in-service testing. Otherwise, portable ammeters, voltmeters, and phase-angle meters shall be used.

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RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

6. PERIODIC TESTING

Periodic Testing of Interconnection-related Protective Functions shall be performed as specified by the manufacturer, or at least every four years. All periodic tests prescribed by the manufacturer shall be performed. The Producer shall maintain periodic test reports or a log for inspection by PG&E. Periodic Testing conforming to PG&E test intervals for the particular line section may be specified by PG&E under special circumstances, such as high fire hazard areas. A system that depends upon a battery for trip power shall be checked and logged once per month for proper voltage. Once every four years, the battery must be either replaced or a discharge test performed. (T)

7. SUPPLEMENTAL TESTING PROCEDURES

This section describes the additional Type Tests necessary to qualify a device as Certified for use on PG&E and other California Electric Corporation's Distribution Systems. These Type Tests are not contained in Underwriters Laboratories UL 1741 Standard *Inverters, Converters and Controllers for Use in Independent Power Systems,* or other referenced standards, but are considered necessary for Certification by PG&E and the other Electrical Corporations.

a. NON-EXPORTING TEST PROCEDURES (T)

(T)

The Non-Exporting test is intended to verify the operation of relays, controllers and inverters designed to limit the export of power and certify the equipment as meeting the requirements of Step 2, Options 1 and 2, of the Initial Review Process. Tests are provided for discrete relay packages and for controllers and inverters that include the intended function.

1) REVERSE POWER RELAY TEST

(T)

This version of the Non-Exporting test procedure is intended for stand-alone reverse power and under power relay packages provided to meet the requirements of Options 1 and 2 of the Non-Exporting screen. It should be understood that in the reverse power application, the relay will provide a trip output with power in the export (toward the PG&E Distribution System) direction. (T)

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

7. SUPPLEMENTAL TESTING PROCEDURES (Cont'd.)

a. NON-EXPORTING TEST PROCEDURES (Cont'd.) (T)

1) REVERSE POWER RELAY TEST (Cont'd.)

Step 1: Power Flow Test at Minimum, Midpoint and Maximum Pickup Level Settings

Determine the appropriate secondary pickup current for the desired export power flow of 0.5 secondary watts (the agreed-upon minimum pickup setting, assumes 5 Amp and 120V CT/PT secondary). Apply nominal voltage with minimum current setting at zero (0) degrees in the trip direction. Increase the current to pickup level. Observe the relay trip's (LCD or computer display) indication of power values. Note the indicated power level at which the relay trips. The power indication should be within 2 percent of the expected power. For relays with adjustable settings, repeat this test at the midpoint, and maximum settings. Repeat at phase angles of 90, 180 and 270 degrees and verify that the relay does not operate (measured watts will be zero or negative). (T) (T)

Step 2: Leading Power Factor Test

Apply rated voltage with a minimum pickup current setting (calculated value for system application) and apply a leading power factor load current in the non-trip direction (current lagging voltage by 135 degrees). Increase the current to relay rated current and verify that the relay does not operate. For relay's with adjustable settings, this test should be repeated at the minimum, midpoint, and maximum settings.

Step 3: Minimum Power Factor Test

At nominal voltage and with the minimum pickup (or ranges) determined in Step 1, adjust the current phase angle to 84 or 276 degrees. Increase the current level to pickup (about 10 times higher than at 0 degrees) and verify that the relay operates. Repeat for phase angles of 90, 180 and 270 degrees and verify that the relay does not operate.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

7. SUPPLEMENTAL TESTING PROCEDURES (Cont'd.)

a. NON-EXPORT TEST PROCEDURES (Cont'd.)

1) REVERSE POWER RELAY TEST (Cont'd.)

Step 4: Negative Sequence Voltage Test

Using the pickup settings determined in Step 1, apply rated relay voltage and current at 180 degrees from tripping direction, to simulate normal load conditions (for 3-phase relays, use I_a at 180, I_b at 60 and I_c at 300 degrees). Remove Phase-1 voltage and observe that the relay does not operate. Repeat for phase-2 and 3.

Step 5: Load Current Test

Using the pickup settings determined in Step 1, apply rated voltage and current at 180 degrees from the tripping direction, to simulate normal load conditions (use I_a at 180, I_b at 300 and I_c at 60 degrees). Observe that the relay does not operate.

Step 6: Unbalanced Fault Test

Using the pickup settings determined in Step 1, apply rated voltage and 2 times rated current, to simulate an unbalanced fault in the non-trip direction (use V_a at 0 degrees, V_b and V_c at 180 degrees, I_a at 180 degrees, I_b at 0 degrees, and I_c at 180 degrees). Observe that the relay, especially single phase, does not mis-operate.

Step 7: Time Delay Settings Test

Apply Step 1 settings and set time delay to minimum setting. Adjust the current source to the appropriate level to determine operating time, and compare against calculated values. Verify that the timer stops when the relay trips. Repeat at midpoint and maximum delay settings.

Step 8: Dielectric Test

Perform the test described in IEC 414 using 2 kV RMS for 1 minute.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

7. SUPPLEMENTAL TESTING PROCEDURES (Cont'd.)

a. NON-EXPORT TEST PROCEDURES (Cont'd.)

1) REVERSE POWER RELAY TEST (Cont'd.)

Step 9: Surge Withstand

Perform the surge withstand test described in IEEE C37.90.1.1989 or the surge withstand test described in J.3.g.

2) UNDER POWER RELAY TEST

In the underpower application, the relay will provide a trip output when import power (toward the Producer's Generating Facility) drops below the specified power level.

Note: For an underpower relay, pickup is defined as the highest power level at which the relay indicates that the power is less than the set setting.

Step 1: Power Flow Test at Minimum, Midpoint and Maximum Pickup Level Settings

Determine the appropriate secondary pickup current for the desired power flow pickup level of 5% of peak load (the agreed-upon minimum pickup setting). Apply rated voltage and current setting at 0 degrees in the direction of normal load current.

Decrease the current to pickup level. Observe the relay's (LCD or computer display) indication of power values. Note the indicated power level at which the relay trips. The power indication should be within 2 percent of the expected power. For relays with adjustable settings, repeat the test at the midpoint, and maximum settings. Repeat at phase angles of 90, 180 and 270 degrees and verify that the relay operates (measured watts will be zero or negative).

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

7. SUPPLEMENTAL TESTING PROCEDURES (Cont'd.)

a. NON-EXPORT TEST PROCEDURES (Cont'd.)

2) UNDER POWER RELAY TEST (Cont'd.)

Step 2: Leading Power Factor Test

Using the pickup current setting determined in step 1, apply rated voltage and rated leading power factor load current in the normal load direction (current leading voltage by 45 degrees). Decrease the current to 145% of the pickup level determined in Step 1 and verify that the relay does not operate. For relays with adjustable settings, repeat the test at the minimum, midpoint, and maximum settings.

Step 3: Minimum Power Factor Test

At nominal voltage and with the minimum pickup (or ranges) determined in Step 1, adjust the current phase angle to 84 or 276 degrees. Decrease the current level to pickup (about 10% of the value at 0 degrees) and verify that the relay operates. Repeat for angles 90, 180 and 270 degrees and verify that the relay operates for any current less than rated current.

Step 4: Negative Sequence Voltage Test

Using the pickup settings determined in Step 1, apply rated relay voltage and 25% of rated current in the normal load direction, to simulate light load conditions. Remove Phase-1 voltage and observe that the relay does not operate, repeat for phase-2 and 3.

Step 5: Unbalanced Fault Test

Using the pickup settings determined in Step 1, apply rated voltage and 2 times rated current, to simulate an unbalanced fault in the normal load direction (use V_a at 0 degrees, V_b and V_c at 180 degrees, I_a at 0 degrees, I_b at 180 degrees, and I_c at 0 degrees). Observe that the relay, especially single phase, operates properly.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

7. SUPPLEMENTAL TESTING PROCEDURES (Cont'd.)

a. NON-EXPORT TEST PROCEDURES (Cont'd.)

2) UNDER POWER RELAY TEST (Cont'd.)

Step 6: Time Delay Settings Test

Apply Step 1 settings and set time delay to minimum setting. Adjust the current source to the appropriate level to determine operating time, and compare against calculated values. Verify that the timer stops when the relay trips. Repeat at midpoint and maximum delay settings.

Step 7: Dielectric Test

Perform the test described in IEC 414 using 2 kV RMS for 1 minute.

Step 8: Surge Withstand

Perform the surge withstand test described in IEEE C37.90.1.1989 or the surge withstand test described in Section J.3.g.

3) FUNCTIONAL TESTS FOR INVERTERS AND CONTROLLERS

Inverters and controllers designed to provide reverse or under power functions shall be tested to certify the intended operation of this function. Two methods are provided: Method 1: If the controller utilizes external current/voltage measurement to determine the reverse or underpower condition, then the controller shall be functionally tested by application of appropriate secondary currents and potentials as described in the Reverse Power Relay Test, Section J.7.a.(1) of this Rule.

Method 2: If external secondary current or potential signals are not used, then unit-specific tests must be conducted to verify that power cannot be exported across the PCC for a period exceeding two seconds. These tests may be factory tests, if the measurement and control points are part of a single unit, or may be provided for in the field.

(Continued)

RULE 21—GENERATING FACILITY INTERCONNECTIONS
(Continued)

J. GENERATING UNIT TESTING AND CERTIFICATION CRITERIA (Cont'd.)

7. SUPPLEMENTAL TESTING PROCEDURES (Cont'd.)

b. IN-RUSH CURRENT TESTS

This test will determine the maximum In-rush Current drawn by the unit.

1) LOCKED-ROTOR METHOD

Use the test procedure defined in NEMA MG-1 (manufacturer's data is acceptable if available).

2) START-UP METHOD

Install and setup the Generating Facility equipment as specified by the manufacturer. Using a calibrated oscilloscope or data acquisition equipment with appropriate speed and accuracy, measure the current draw at the Point of Interconnection as the Generating Facility starts up and parallels with PG&E's Distribution System. Startup shall follow the normal, manufacturer-specified procedure. Sufficient time and current resolution and accuracy shall be used to capture the maximum current draw within five percent. In-rush Current is defined as the maximum current draw from PG&E during the startup process, using a 10-cycle moving average. During the test, the utility source, real or simulated, must be capable of maintaining voltage within +/- five percent of rated at the connection to the unit under test. Repeat this test five times. Report the highest 10-cycle current as the In-rush Current. A graphical representation of the time-current characteristic along with the certified In-rush Current must be included in the test report and made available to PG&E.

(Continued)